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The American STATISTICIAN

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The news publication of the
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Annual Meeting Session Proposals

Herbert Solomon, chairman of the 1953 Annual Meeting Program Committee has been reviewing the proposals received from the membership for the 1952 meeting. He finds that there is still such a wealth of material that has not been used for program planning that he has decided to continue to work with last years suggestions instead of asking for additional ideas this year.

New York Chapter Plans UN Meeting

The New York Area Chapter is holding another meeting at the United Nations on Friday, February 6th, at 8 p.m. The occasion is the forthcoming session of the Statistical Commission to the United Nations. On the program are Mr. Harry Campion, United Kingdom, speaking on "The Work of the United Nations Statistical Commission," and Dr. Philip J. Idenburg of the Netherlands on "Statistics and Culture." Herbert Marshall, Dominion Statistician for Canada, will be chairman. Joining the New York Area Chapter for this occasion are the Washington Statistical Society, the Central New Jersey Chapter and the Ithaca Chapter. There will most likely be a dinner arrangement before the meeting to which members are invited to bring guests.

NEWS

New Educational Centers — Fellowships Offered — Meetings

University of Chicago Program Of Post-Doctoral Awards

Three $4,000 post-doctoral fellowships in Statistics are offered for 1953-54 by the University of Chicago. The purpose of these fellowships, which are open to holders of the doctor's degree or its equivalent in research accomplishment, it to acquaint established research workers in the biological, physical, and social sciences with the crucial role of modern statistical analysis in the planning of experiments and other investigative programs, and in the analysis of empirical data. The development of the field of Statistics has been so rapid that most current research falls far short of attainable standards, and these fellowships (which represent the third year of a five-year program supported by The Rockefeller Foundation) are intended to help reduce the lag by giving statistical training to scientists whose primary interests are in substantive fields rather than in Statistics itself. The closing date for applications is February 1, 1953; instructions for applying may be obtained from the Committee on Statistics, University of Chicago, Chicago 37.

Soldier Statisticians Organize Society at Army Post

The ACC Industrial Statistical Society, an organization of enlisted men working in statistical jobs at the Army Chemical Center, has recently expanded its ranks to include several civilian employees who were soldiers stationed here before they were released from active duty.

At the club's last meeting M. H. Replogle, assistant director of standards for the Davison Chemical Company in Baltimore, addressed the members on "Applications of Statistical Quality Techniques to Bulk Chemical Samplings."

The society was formed early in 1952. Pfc. Leonard Janofsky of Bayonne, New Jersey, a graduate of New York University, originated the idea of the society and was instrumental in getting it started.

The club meets approximately every six weeks, usually with a guest speaker on hand. They are currently engaged in preparing statistical material furnished by E. B. Godsey, a statistician employed by the Chemical Corps Material Command in Baltimore, for distribution to all statisticians employed or stationed at this research and development installation of the Army Chemical Corps.

Operations Research Society of America

The first regular meeting of the newly formed Operations Research Society of America, organized by a group of leading scientists to promote the application of scientific methods to business and military problems, was held on November 17th and 18th at the National Bureau of Standards, Washington, D. C.

The group, including experts from the fields of physics, chemistry, biology, mathematics, economics, and statistics, participated in a research panel on the solution of new problems and the development of new methods which have arisen in industry during the last year, as well as a panel on the relation of operations research to industrial management.

The meeting heard and discussed papers on the newly developed Monte Carlo method for handling problems which cannot be solved with ordinary equations. Gilbert W. King of Arthur D. Little, Inc. discussed "The Monte Carlo Method as a Natural Mode of Expression of a Working Model of Operations," and L. H. Thomas and Andrew W. Marshall dealt with other aspects of this method.

I. Kesseler presented a paper on "The Control of Quality in the Maintenance of Aircraft," D. Boodman spoke on "The Reliability of Airborne Radars," Wroe Alderson discussed "Applications of Search Theory in Marketing," and David E. Debeau "The Development of Control and Planning Procedures for the Air Proving Ground Command."

A session was devoted to "Waiting Times, Supply Lines and Fluctuation Theory" and to "Theories of Pay Offs, Measures of Effectiveness and Worth." N. Smith and S. Walters discussed "Theories of Value," while Martin L. Ernst spoke on "Measures of Effectiveness."

Other speakers were William Feller of Princeton University, Sabastian Littauer of Columbia University, and Ellis Johnson of the Army Operations Research Office.

Statisticians Conclude Seminar Held At UN Headquarters and in Ottawa

A four-week International Seminar on Statistical Organization, sponsored by the UN Technical Assistance Administration and the UN Statistical Office in cooperation with the Government of Canada was concluded at UN Headquarters early in November.

Twenty-six directors and senior officials of national statistical services were present from countries which had requested United Nations assistance on statistical matters. The participants were able to exchange views on statistical organization, acquire documentation on specific fields of statistics, and undertake field trips to observe at close range the operation of highly developed statistical offices.

The first part of the seminar was conducted in Ottawa from 13 October to 31 October, and activities of the final week were centered in the Statistical Office of the United Nations at UN Headquarters.

The Ottawa meeting enabled senior statistical officials from many nations to discuss and exchange opinions on the principal problems relating to the effective organization and operation of a government statistical office. Those problems were essentially concerned with the following:

(a) the type of structure and organization which would reflect the nature of the country's economy;

(b) the means of maintaining effective coordination and control over all government statistical activities;

(c) the techniques for the most effecient utilization of staff and equipment;

(d) the provision for the training of statisticians.

The Ottawa meeting was directed by H. Marshall, Dominion Statistician of the Canadian Government; William R. Leonard, Director of the UN Statistical Office, was in charge of the New York activities.

In New York, participants visited leading American firms specializing in the statistical field. The group was addressed at Headquarters by Guillaume Georges-Picot, Assistant Secretary-General of the Departments of Economic and of Social Affairs; Roy Blough, Principal Director, Department of Economic Affairs; and David Owen, Chairman of the Technical Assistance Board.

The following were represented at the seminar: Burma, Bolivia, Brazil, Chile, Costa Rica, Cuba, Colombia, Ceylon, Dominican Republic, Ecuador, El Salvador, Haiti, India, Iran, Indonesia, Israel, Jamaica, Japan, Philippines, Paraguay, Panama, Puerto Rico, Pakistan, Syria, Thailand, and Turkey.

A comprehensive report on the seminar will be issued shortly by the United Nations Statistical Office.

Statistics Center Established At Cornell University

Cornell University has established a Statistics Center to coordinate its consulting and teaching facilities in the statistical field. This Center's primary function will be to offer guidance to the various schools and department of Cornell. Acting Director of the Center will be Professor Philip J. McCarthy of New York State School of Industrial and Labor Relations at Cornell.

Institute of Social Studies Established in the Hague

The Universities of the Netherlands have joined in the establishment of the Institute of Social Studies in The Hague. Although subsidized by the Netherlands Government, the Institute is independent. It will provide a center for research; will offer post graduate courses leading to the degree of Master of Arts in social sciences and will in addition provide short courses for Dutch as well as foreign students. Details concerning admission, fees, scholarships, etcetera may be obtained from the Institute of Social Studies, 27 Molenstraat, The Hague, Holland.

Intra-Company Statistics in the Standard Oil Company (New Jersey)

by C. ASHLEY WRIGHT

This is the fourth and last of a group of papers on intra-company statistics given at the Annual Meeting held in Boston, December 1951, and published in The American Statistician.

After such excellent technical papers as those presented by the three previous speakers, it perhaps is fitting that the last on the program should provide a change of pace. It is to be hoped that this, the fourth paper, will serve two equally useful purposes. First, it should permit you, in the last part of so stimulating a session, to sit back in your comfortable chairs in a mood of drowsy contentment. Second, it may provide a general survey of how one large organization develops and uses statistical material as one of the many tools which are available as an aid to sound business judgment and how the development of that tool is related to organization and management.

The use of intra-company statistics in the Standard Oil Company (N.J.) is intimately connected with the role that Jersey envisages for itself and the organizational plan which it has developed and is developing in order to deal with its manifold problems. Technically Jersey, the parent company, is a holding company. Those of us who work for it like to believe that it is unusual in its field and that it has special virtues of its own which are not static but which are constantly developing in response to the stimulus of new conditions and new problems.

After the dissolution of the old Standard Oil Company in 1911, the Jersey company was left with a rather heterogeneous collection of oil properties. During the next 15 years these were considerable modified and expanded, especially in the foreign field. The extended old and new interests of the company presented it with new and complicated problems in efficient organization and management. On the one hand current operational control required the guidance of highly trained specialists in different operating fields. On the other, there was a need for top level policy planning and coordination by men of broad horizon whose time and energies were not absorbed by day-to-day operating problems.

These conflicting needs were met by divorcing the parent company of its principal operating functions and thus releasing the time and energies of the directors for long-range planning, the consideration of broad policy, and the coordination of the activities of Jersey's affiliates. The first step in this process was taken in 1927 under the farsighted guidance of Mr. Walter Teagle, then Jersey's President.

By an evolutionary process, which is perhaps never complete and final, operational control has been decentralized to appropriate affiliates. This also may be said of many planning, research and coordination functions. These operations are carried on by affiliates in those fields in which they have a natural advantage through greater familiarity with the details of their specialties, more intimate contact with local conditions, and closer access to sources of detailed and specialized information. The parent company, on the other hand, conducts its activities in those areas in which it too has natural advantages through its ability to tap more and broader information sources, to recognize problems and solutions common to two or more affiliates, and to study the inter-relations which exist between the policies of different affiliates on the one hand, and between those policies and the rest of the petroleum industry and other parts of the world economy on the other.

This advantage of over-all viewpoint enables the parent company not only to facilitate coordination of the current operations, long-run investment plans and policies of its affiliates, but also to render them services which would otherwise not be available. By keeping in touch with the special problems of its affiliates and with national and international developments in such fields as employee relations, public relations, production, transportation, refining, storage, and marketing of petroleum products, current and prospective technological developments in the industry, planned investment in petroleum facilities, international trade and foreign exchange, finance and broad economic trends, Jersey is able to assist its affiliates by providing a consulting and advisory service. A policy of decentralized supervision, designed among other things to encourage independent initiative and resourcefulness, requires heavy reliance on the ability to present a convincing argument. This ability, in turn, must be based on a thorough grasp of the basic problems involved and on information and technical knowledge not otherwise easily available.

The statistical information assembled by the various departments and staff sections of the Jersey company have, of course, been developed primarily to meet these requirements of coordination and advisory assistance. Since inter-affiliate coordination in a company

which carries on operations in roughly 140 countries and dependencies is intimately connected with world economic conditions both in general and in the petroleum industry, two staff divisions concentrate respectively in these fields.

The first of these specializes in following and anticipating general economic conditions, both in the United States and in foreign countries. The subject of this paper bars a detailed discussion of its interests, activities and special problems. It is perhaps sufficient to point out that it seeks to develop the theory and basic quantitative data both for the evaluation of those general economic conditions which determines the environment within which the Jersey organization must conduct its affairs and for the use of other divisions in their increasingly specific studies ranging from the over-all world-wide petroleum scene, through over-all company operations, to specific detailed problems of affiliates, branches of the industry, or geographical areas. The work of this division is conditioned by the vastness and intricacy of the field of its specialty, the size of its staff, the nature of the requests it receives and, especially in the foreign area, limitations of suitable available data. For foreign countries heavy reliance must be placed on foreign trade statistics, especially those pertaining to the balance of payments, financial and banking series, and production series where they exist. In only a few countries are there useful national income statistics, though fortunately these exist for the more important European countries and some others, and much is being done, especially by the United Nations, to provide such data where they are not now available. Where these series now exist, they usually are released on an annual basis only, after many months have elapsed.

The second division concentrates on a study of the world-wide petroleum demand and supply picture for crude oil and the five major categories of petroleum products; gasoline, kerosene, distillates, residual and miscellaneous products, including lubricants and liquefied petroleum gas. This material is assembled from the reports of affiliates, government publications, and trade journals, both at home and abroad. For the United States, the five major products may be broken down in a typical example into some 35 classes of end use, some of which may be separated further for purposes of detailed analyses. These can be cross-classified by major geographical districts. End use categories have been subjected to a good deal of analysis and study, mainly for the purpose of developing and refining forecasts which are made each year for five year periods. In the foreign field less detail is available and less has been done in the analyses of products by end use, for lack of adequate data. Nevertheless, a good supply and demand picture can be built up for the major products by geographical areas and for most countries, including the largest petroleum consumers outside Russia. The quality of the estimates varies considerably since in some countries, usually the smaller and less developed ones, inadequate data are available, while in others data are published on an annual, quarterly or monthly basis with varying time lags which generally are longer than desirable from the point of view of the voracious consumer of statistics. The production of crude is an exception, largely because the terms surrounding the granting of concessions have produced prompt and accurate statistics as an administrative by-product.

On the whole, the petroleum industry in the United States is better supplied than most with current data but only about as well supplied with time series as the average major industry — not as well supplied as, say, the public utilities, but better than the newer industries such as radio and television. Many of its basic series commence in the 1930's when the efforts of governments to solve the challenge of severe unemployment necessitated the accumulation of much information not previously available. This vastly complicates the problem of forecasting accurately certain products or uses which depend intimately on general economic conditions. In many cases the series which must be used for this purpose cover only the middle and latter part of the Great Depression, the war period, and the immediate postwar years. Only two mild business cycle declines are included, 1937-8 and 1948-9, a small sample from which to measure the influence of the business cycle on the demand for individual petroleum products.

There is a great variety of limitations and difficulties which beset the data relevant to the detailed analyses of products by end use. It would take us much too far afield to discuss these here. There remain two principal limitations on the available data which are of considerable importance and interrelated. The first of them is that "demand" figures for petroleum products as usually used are not consumption figures at all but refinery and major terminal disappearances, (i.e., production, adjusted for stock changes). The bulk of refinery disappearances moves to distributors of one sort or another, and this brings up the second important inadequacy of the basic data. This is the fact that distributors' and consumers' storage capacity and changes in stocks over periods of time are generally unknown. Refinery disappearance may differ from sales to consumers by changes in distributors' inventories and since these are unknown, disappear-

ances involve errors when used to measure sales to consumers. When used as a measure of final consumption, a further error is introduced since consumers' stocks may change. Efforts have been made to overcome this difficulty — with relatively little success — but the magnitude of these and other sources of error appears to be small enough so that the data may be relied upon for most but not all purposes. For some products and classifications percentage errors appear to be small, perhaps less than 1%. For others the total error in historical "consumption" data may be several times as large though regarded as refinery disappearances these errors would be much less.

By this time it may be wondered why so much space has been given in this paper to "extra-company" statistics when its title refers only to "intra-company" statistics. The reason is that general economic conditions summarized in statistical form and similar information for the petroleum industry world-wide provide a background against which the past experience and future plans of affiliates, as summarized in analogous statistics, may be evaluated. Coordinating plans and assisting in the operations of such wide-flung interests as those of the Jersey affiliates requires constant consideration of those factors, both economic and specific to petroleum, which influence the industry world-wide.

A third division of the parent company is concerned with the over-all supply and demand operations and future operating plans of the Jersey affiliates. Reports and forecasts of demand requirements are prepared by marketing subdivisions of the Jersey affiliates and submitted through a marketing coordinator who reviews them and may discuss adjustments and changes with the affiliates before forwarding them for consolidation. Similar information on supplies is channeled through coordinators for refining and producing. The material so collected is assembled by the division charged with this function in various ways: by different categories of crude oil, the raw material of the petroleum industry, and of major petroleum products, by principal affiliates and functional units, refineries for example, and by geographical producing, refining and consuming areas.

This process results in a detailed picture of the supplies, requirements, indicated stock changes, and estimated net future surpluses and deficits of crude and each major product for each major affiliate and exporting refinery and for each country and major geographical area in which the Jersey organization conducts its affairs. These forecasted supply and requirement balances, net anticipated averages and shortages, present in their most concentrated form material which is basic to assisting affiliates to adjust supplies to anticipated future local demands in the cheapest and most economical manner.

The process of assembling, coordinating, and analyzing intra-company data is not restricted to nor does it end with the work of the three divisions as described above. The adjustment of inter-affiliate and inter-geographical supply-requirement balances necessitates roughly analogous studies of the most economical routes and means of transport. These studies, like those described earlier, must be projected into the future for future planning purposes. This is a specialized field in itself, into which we need not venture, involving as it does a knowledge of present conditions and future trends in rail transportation, pipe-lines, and the international market for and employment of the world's tanker fleet. In general, studies in this field are made by specialists who are continuously supplied with information prepared by the other divisions and departments of the company with which continuous liaison is maintained.

It is not the purpose of this paper to discuss policies or policy formation, but rather to stress manner in which statistical material is assembled, analyzed and used in making the detailed studies which are basic aids to sound policies and the rendering of efficient technical assistance to affiliates. Most of these analyses are made in other divisions and departments of the company, each of which assembles information relevant to its own specialty and coordinates its reports, studies and necessary assumptions concerning the future with those of others in related fields. The Comptroller's Department, for example, not only follows and analyzes the past and present financial history of affiliates, but forecasts financial prospects which are relevant to a consideration of investment programs which, in turn, are suggested by prospective supply-requirement balances. The Treasurer's Department makes studies of the means of financing alternative budget proposals and assembles information relevant to a consideration of such proposals and of over-all current operations from a financial point of view. Analogous studies are made of proposed capital expenditure programs under the supervision of the Budget Department, and so on. Generally speaking, this work is based on and conditioned in varying degrees by the background material pertaining to expected economic conditions, industry conditions, and positions of the affiliates, previously described. The economics of alternative means of meeting present and expected future changes in supply-requirement balances are under constant review in the light of the specialized knowledge and information supplied by these different groups of specialists.

These and other departments are usual in large corporations. In addition, Jersey has four others, each under a "coordinator," which specializes in the principal functional aspects of the industry, that is, on producing, transporting, refining, and marketing petroleum and its products. These coordination groups, as suggested previously, are responsible, among other things, for the assembly and review of information pertaining to their fields supplied by the affiliates and obtained from outside sources. The marketers, for example, review estimates of requirements before they are passed to the division responsible for the over-all analysis of requirements versus supplies. In addition to this role, they have specialized responsibilities in their own fields and these, of course, involve the assembly, analysis, and dissemination of specialized data. Moreover, they have advisory and coordinationg functions on the technical level and in the field of research. The marketers, if they may be used again as an example, analyze the technical studies and techniques of the affiliates in the light of developments in the fields of market and of marketing research, and they assist the affiliates by making available to them methods developed both within and without the company, adapted where desirable to the needs and circumstances of the using affiliate.

The technically minded will wonder why nothing has been said about the role of statistical method in relation to processes of collection and analysis of statistical material. This is because the methods of mathematical statistics have been used very little in the analysis of what might be termed "management" statistics, outside of a few well-known and traditional fields of application. Generally speaking, in the Jersey organization advanced statistical methods have been applied only by outside consultants in connection with special projects, such as the development of objective employee rating reports, or by the research divisions of some of the affiliates. For example, mathematical models using simple multivariate polynomials involving cross-products and second powers of independent variables have been set up for the purpose of analyzing the operating characteristics of phenol treating towers and laying the basis for the improvement of experimental design. Resulting systems of equations for the determination of up to 15 parameters have been solved with the aid of IBM equipment. Similar work is now in progress in connection with the analysis of other refining processes. The methods of statistical quality control have only recently begun to be applied to refinery processes.

The variety of "intra-company statistics" in the Jersey organization precludes systematic treatment of detailed problems in a short paper. For this reason emphasis has been placed on the relationship of the processes of assembling, analyzing, and using statistical data to the problems of managerial organization and control in a company which attempts to combine the special advantages of decentralized operation, planning and research with the special advantages to be obtained in these new fields from the centralized development of a wide perspective on economic, industry and company affairs. Broadly speaking, it may be said that the statistical activities of the Jersey organization separate themselves into two interlocking classes. One pertains to the crystalization and evaluation of the economic, industrial, and company aspects of the problem of meeting the world's almost insatiable demand for oil. The other pertains to the technical and functional aspects of the same problem, in the fields of producing, refining, transportation, marketing, technology, long-range budget planning, economy, and finance. Efficiency demands that the individual tasks necessary to these activities shall be delegated to those levels best equipped to deal with them by virtue of their special position, information, and knowledge, and that each shall contribute in the manner of a smoothly coordinated team to the common goal.

Training in Mathematics and Statistics Desirable for Employees at Various Levels in an Educational Research Organization

by HAROLD GULLIKSEN
Educational Testing Service

These two papers, by Gulliksen and Tepping, with the discussion by Frankel, formed part of a session on training in statistics at the 111th Annual Meeting of the Association. The Session was under the chairmanship of Charles A. Glover.

The following remarks regarding various classes of employees with respect to mathematical-statistical training will be made primarily with reference to the activities of the Educational Testing Service at Princeton. As testing organizations go it is a large organization. If it is compared with business concerns in general it would be considered relatively small. As a rough index of size it could be stated that we have about 300 full-time employees and a yearly operating budget of approximately $2,000,000.

The following is a tentative classification of employees who utilize statistics, giving primary emphasis to the degree of training which they have in mathematics and in statistical techniques. For this purpose we may think of six groups as follows:

Group 1—For persons in this group a high school education is probably more than adequate. An illustration of duties would be the operation of a desk-type calculator according to standard procedures and the utilization of computing forms already specified by others. About 10 or 20 computers with such duties and training are utilized in the organization.

Group 2—The persons in this group would have a bachelor's degree in some department other than mathematics and statistics with a minor in mathematics and statistics. Persons at this level of training might work, for example, in the research department at ETS assisting the research workers in various studies or they might work in the test development group writing items in various subject-matter fields. Such work requires sufficient understanding of statistics to interpret the information commonly furnished about tests and items. Again about 10 or 20 such persons are utilized in this organization.

Group 3—Members of this group would have a bachelor's degree in statistics or its equivalent. Various jobs, primarily in the statistical analysis department, would be most suitable for such persons. They would be given the responsibility for relatively novel jobs in computing and also for laying out their own computing procedures. They could be given general instructions regarding the job to be done and the formulas to be used; and independently lay out the computing routines and perhaps also assume responsibility for the speed and accuracy of the work of other computers. After the persons at this level have been in the organization for some time they would perhaps have developed sufficient sophistication in education and psychology to be able to plan and summarize statistical analyses of a routine character. In test development such a person would probably be found in the mathematics section working particularly on the preparation and evaluation of mathematics items. There are about 5 to 10 positions where a person of this type would be useful. That is, relatively few persons with bachelor's degree training are required. There is greater use of persons with *less* training and also, as we shall see, greater use of persons with *more* training.

Group 4—Persons in this group would have considerable training in education and psychology as represented, for example, by a master's degree in education, in psychology, or in educational psychology with a strong minor in mathematics and statistics, perhaps equivalent to a good bachelor's program in these fields. Persons at this level of training would be found under various titles in research, in statistical analysis, and in test development. They would plan, carry out, and report on minor research studies, or conduct statistical analyses, under the supervision of a more qualified and experienced person in the field. Probably some 10 to 20 persons with training at this level are utilized at the Educational Testing Service.

Group 5—Members of this group would typically have a Ph.D. in education or psychology with a strong minor in statistics and mathematics. Such persons would have the upper-level positions in research, statistical analysis, and test development. In test development such a person would be responsible for planning the program in a given area and for interpreting the

studies made on tests. In statistical analysis they would be responsible for planning and directing statistical work associated with a specific testing project, interpreting the data, and preparing the necessary reports. In research they would be responsible for planning, directing, interpreting results, and preparing reports for a research program. Again about 10 or 20 persons with training of this sort would be useful in ETS.

Group 6—Persons in this group would have the equivalent of a Ph.D. in mathematical statistics. Occasionally in research studies and in testing programs, various problems regarding statistical analyses arise at an advanced level. The choice of experimental design and statistical method requires advanced professional judgment. Sometimes these problems may require the extension of formulas already available, or the development of new methods and formulas. For such problems it is desirable to have either on the staff, or available for consulting purposes, persons at the Ph.D. level in mathematical statistics. Two or three persons at this level have been able to solve the problems which have arisen during the last five years at ETS. Such services can be satisfactorily rendered either by a full-time employee, a part-time employee, or a consultant, or by various combinations of these three types.

Having indicated that ETS would have use for people at various levels, including a minor in mathematics or statistics, a bachelor's degree in the field, and up to a Ph.D. in the field, we might consider briefly what type of statistical training for the degree would be most appropriate. I shall limit the discussion here solely to the bachelor's degree program. As far as the mathematical training is concerned, such persons should have a good knowledge of mathematics, at least through calculus including emphasis on analytical geometry in order that they might be acquainted with the relationship between graphic and analytical procedures. It is also essential that such persons have a thorough knowledge of determinants and of matrix algebra in order to handle problems of multivariate analysis. The work in statistics should stress particularly the multivariate methods since persons working in testing programs will be called on to handle problems such as the computation of large tables of intercorrelations, multiple correlation and regression problems, as well as factor analyses including the centroid method, multiple group methods, and rotation of axes. The responsibility for dealing with more advanced problems is usually undertaken only after considerable on-the-job training, but the persons who understood multivariate analysis would be able to move along to more responsible positions more rapidly. With respect to computing routines, again ETS has its own routines set up for efficient computations. It might be helpful, however, if persons at the bachelor's degree level had some knowledge of efficient routines for multivariate computations, including routines both for desk calculators and for various types of IBM equipment. However, it might be more effective to obtain such knowledge in training given on the job.

A Desirable Undergraduate Training Program in Statistics

by BENJAMIN J. TEPPING
Bureau of the Census

Since I appear to be the only person in the government service on this panel, I should say at the outset that the views that I shall express are not necessarily representative of the views of all government statisticians, or even of the views of all in the Bureau of the Census. There are, however, many who will agree with me, and I believe that as the available supply of well-trained recruits to the statistical profession increases, there will be more.

The range of statistical activities in the Federal Government is of course very broad, and this is often true even within a single agency such as the Bureau of the Census. Some of the statistical positions, at the higher levels, are highly specialized and require an intimate knowledge of special aspects of the Census Bureau's work. At the level at which young statisticians enter the government service directly after taking a Bachelor's Degree, the Civil Service Commission makes no very sharp distinctions among different kinds of statisticians. The agencies employing these people do however consider the applicants in view of the work they will have to do. When these young statisticians rise to the next grade and to the higher ones, they are classified into three broad groups. These groups are Mathematical Statisticians, Analytical Statisticians and Survey Statisticians.

The Mathematical Statistician is concerned with the development and adaptation of statistical theory and methodology to specific or general problems and with the evaluation of the applicability and usefulness of

specific statistical techniques being used by others. He usually spends a great deal of his time in actually organizing statistical investigations, surveys, or experiments and in advising others, on the basis of his specialized mathematical knowledge.

The Analytical Statistician is primarily concerned with some subject-matter field to which he applies statistical theory in order to develop an organized body of scientific knowledge in that field, to draw inferences and to make predictions. It is particularly important that the Analytical Statistician be intimately acquainted with the subject-matter field in which he works. He is distinguished from the subject-matter specialist, however, by a marked emphasis on the selection and proper application of statistical methods to his problems.

The Survey Statistician is concerned with the scientific organization of plans for gathering statistical data, through surveys or other data gathering systems, and for processing such data. He often has responsibility for deciding which data it will be possible to collect and for developing an efficient operation for the collection, summarization and presentation of statistics. He must have a professional understanding of the statistical techniques involved, as well as considerable acquaintance with the subject-matter, so that he may make intelligent choices among the alternative approaches that may be available to him.

Actually, the lines separating these three kinds of statisticians are not always sharply drawn in practice, nor should they be. Almost every statistician will have some duties in each of the three regions, although it is usual to find an emphasis on one of them.

It should be kept in mind that the junior statistician will enter one of these positions somewhat later. We must necessarily keep in mind the kinds of positions into which these people will eventually go. Much of the training necessary for a person who will eventually be a Mathematical Statistician is, it seems to me, reasonably clear, and we need not concern ourselves with it here, except to observe that the following remarks apply also to him. It is the training of Analytical Statisticians and Survey Statisticians that presents a problem.

At present the Civil Service requirements for a junior statistician include 15 semester hours in statistics or in a combination of mathematics and statistics, of which at least 6 hours are in statistics, as well as 9 additional semester hours in some subject-matter field. This requirement cannot insure obtaining well qualified candidates unless the courses represented by the credits are well designed and presented. Unfortunately many of the persons who present these credits have been exposed to a miscellany of elementary and overlapping courses.

I do not wish to deprecate the content of the usual introductory course in statistics. The computations of the common statistical measures, the skillful definition of useful statistical measures, and the elements of presentation of statistics are essential. But the computation and the presentation of descriptive statistics is not sufficient.

The business of statistics is inference. Certainly valid inference demands an appreciation of the usefulness and limitations of data. The student must therefore be given a grounding on the conditions under which statistical inferences can be made and the kinds of inferences that can be made. It is obvious that a job that involves the collection of data from sample surveys or from experiments requires such knowledge.

On the other hand, it may be objected that there are many jobs of collecting and compiling statistics, which involve drawing no statistical inferences. For example, the gathering of data in a certain field may be specified by law, and the procedures fixed by precedent. I need not belabor the fact that these data are not an end in themselves, except by default, and that they are intended to serve as a basis for some decision or other action. The data may, of course, be a complete count of some population, and if the population is small enough and the problem simple enough there may be necessary only the administrative ability to organize an accounting procedure that avoids errors reasonably well and provides an intelligible summary. But even data intended to be a complete count are rarely complete in practice and this at once introduces many statistical problems such as those concerned with replacing the count by a sample survey or by an experiment, or devising methods of evaluating the accuracy of the count.

The existence of these situations leads at once to what may be regarded as the central problem of statistics: Among the various alternatives that are available in a given situation, which one yields the most information with regard to a specified question that is to be answered? It is important that this problem should be at the focus of the training of the undergraduate student of statistics, and that it should be shown clearly that statistical methodology consists of approaches to the solution of various problems of this type. For many such problems there are not yet unequivocal solutions, and for some of them there may never be. But a realization by the statistician that it is his function to provide information, not merely to compile numbers, will surely tend to improve the usefulness of his work.

Along with such studies there must go a close examination of the conditions surrounding the collection of actual statistical data that are used for many purposes, so that the student may develop an appre-

ciation of the limitations to which statistical data may be and often are subject. The student must himself get sufficient contact with the problems that are involved in the collection of data that he will be able to understand their limitations.

In addition then to the students learning how to compute the usual statistical measures and how to prepare tables and charts, he should be permitted to participate actively in a statistical project in all its phases from the initial planning for the collection of the data to the final presentation and analysis of the results. He should be acquainted with the distinction that often exists between the way a data gathering procedure is intended to work and the way it actually does work. He should learn something of the various sampling schemes that are customarily used in the surveys and in the situations in which the various alternatives are appropriate. He should learn to look critically at statistical data and to inquire whether the data are completely described. He should learn to use the concept of the sampling distribution. He should examine critically a large variety of statistical results and their origins, preferably in a subject-matter field with which he is familiar or is willing to become well acquainted.

How much class work is required for the student to obtain this kind of familiarity with the applications of statistics? I am inclined to believe that the student cannot obtain a thorough understanding of the applications without a grounding in mathematics, say, through the calculus, and some course work in theoretical statistics, and in one or more fields of applied statistics such as experimental or sample survey design, quality control, etc. If this were followed or accompanied by experience in the problems of gathering and analyzing data under the guidance of a teacher who has had extensive experience with these problems, a student would be well prepared to profit by an apprenticeship as junior statistician in some particular field.

Discussion

by LESTER R. FRANKEL
Technical Director, Alfred Politz Research, Inc.

In discussing the type of training required for statisticians in business, it is apparent from the previous discussion that statisticians may be classified into two groups on the basis of the type of organization in which the statistician is employed. In one group, as described by Tepping and Gullicksen, we find statisticians who are employed by large statistical organizations whose prime function is to produce or analyze statistics. These organizations are characterized by the fact that there are various levels and types of statisticians. It was pointed out that the Census Bureau tends to classify statisticians as mathematical statisticians, analytical statisticians and survey statisticians. In the Educational Testing Service, Mr. Gullicksen mentions Grades 1 through 6. Within each level or type, the statistician has specifically defined duties. While the statistician's work in these organizations eventually determines policy decisions, the statistician himself usually is not personally connected with the making of these decisions. In general, when employed in a large statistical organization the statistician is, in many respects, a technician.

The employer of statisticians in this category expects the young statistician to have sound training in statistical methodology. In addition, the statistician should have the proper mathematical background to understand the techniques he currently uses and to provide the basis for the development of new techniques. It would appear that a minimum of mathematics through calculus is required for the lower level jobs, while higher mathematics is required for the more advanced positions. If the statistical organization is in some specialized field of application, the young statistician should have a thorough understanding of the subject matter in that field.

The other type of statistician is usually employed in an organization that has a relatively small statistical department or in an advisory organization such as one engaged in market research. In these organizations the statistician often is not even referred to as a statistician, but may have the title of research analyst, research director or project director. Generally, there are no specifically defined technical duties. Technical competence is taken as a matter of course.

In an organization dealing with a specific product or class of products, the research (statistical) department, which usually consists of relatively few employees, may be called upon to handle a variety of problems ranging from personnel relations, product testing, marketing research, quality control, public relations, and others, as described by Mr. Flaherty. In a market research organization there are unlimited

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Conference on Business Statistics, University of Pennsylvania, June 1952

Report on Production Scheduling Section

by RAYMOND T. BOWMAN
Moderator

The Moderator remarked that production and its scheduling is a broad field and that, during the conference, the members should try – given the diversity of interests of the group – to keep to the subject of statistics and its application to production scheduling.

There is much promise for statistics in this area. Perhaps the results secured in quality control can be extended to this area. Statistical methods offer an economy in production control as contrasted with non-sampling control methods.

Prof. W. W. Cooper, the assistant moderator, noted that both academic and business interests were in the group. Because of this, there should be good cross reference. He pointed out that linear programming is a program fulfilling certain objectives subject to particular restraints. Typically, there are limited facilities with which to produce particular products or meet the desired objectives. The objectives and constraints are put in mathematical form. The constraints establish inequalities which limit the functions. Input condition – the major limiting constraints – are put into functions. Then a simultaneous solution is made of the system to maximize profits, minimize costs, or best approach some other criterion of production. It is a technique of utilizing market forecasts in the best way, but it should be realized that it does not directly improve such forecasting. Linear programming is applicable to plants with less than capacity operations as well as to those operating at capacity, though the latter is probably more important. The technique should deal with economic, not accounting costs, since a system of alternatives is explicitly recognized.

Specific production problems included the case of a sand paper business which is concerned with production planning of a highly expensive piece of equipment capable of producing forty or more different types of sand paper. Inventory controls, market surveys, profit margins, and quality of personnel were all involved. A second problem involved a company producing band instruments where there was need for a good sales forecast one year in advance. This forecasting problem became complicated due to materials allocations after the Korean War began, with changed production mixes having different effects on materials, profits, wages, etc. The problem appears to be too complicated for the basic IBM machines. A similar problem is being done on a Univac at the Pentagon. A system of general interdependence is set up and solved. Here, lead times and production coefficient vary, however, as shifts are made. These are further complicated by union policies with respect to shifting of jobs. This takes 6-8 weeks frequently to settle the "bumping" effects.

In the afternoon of June 12, Professor Bowman noted that there had been little emphasis on statistics in the morning session and that more could properly be included in this session. Dr. W. Edwards Deming, of the Bureau of the Budget, was asked what statistical methods offered production control. Dr. Deming feels that most production problems are difficult to handle statistically, but there is a storehouse of technical knowledge of how to treat data which is readily applicable. Take the problem of inventories as an illustration. One could just keep "enough" so that they are never caught short. But this involves a considerable economic loss.

Statistical theory does offer some good ways of avoiding losses due to too little or too much inventory. Inventory requirements for sales of a certain size can be found with certain degrees of probability of being caught short. The larger the size of "average" sales, the lower the percentage of sales that must be kept on hand to meet deviations from that average. Thus, problems of small vs. large samples are involved for studies of fast and of slow moving sales. There are simple theories and uncomplicated examples, yet they are indicative of what statistics can do.

Small numbers which operate by chance should not be subjected to prediction on a probability basis. Practically, moreover, such numbers as applied to production usually relate to a good which is uneconomical to produce anyhow.

Statistical knowledge and its distribution to industry is essential. A modern large business just can't stay in operation without it. If statistics won't make a better product they at least show ways of producing the product more cheaply. We're in an age where the ability of a business to compete depends to a large measure on the adequacy of statistical techniques.

Tremendous uniformity and mass production techniques rely heavily on statistics and sampling. It was only 10 years ago that the initial conference was held on this subject at Stanford. The American Society for Quality Control was started only in 1946.

Charles C. Holt, Professor of Economics at Carnegie Institute of Technology, reported on 1½ years work of Carnegie covering one single product with highly variable sales. The analytic procedure is to take out particular phases of the whole process and relate these to the sales input with an autocorrelation technique. Rules are established for cost minimizing in each phase, and then the best (i.e., least cost) combination is selected. Then, the improved performance which results from better statistical forecasting must be set against the cost of that research. The object is to get a set of operating rules which may be used for some time. It is a way of getting "scientific" rules of thumb. Changes in sales, etc., can be included by the insertion of "dynamic responses" in the model. Time lags and dynamic costs should be included also. Later, it is hoped that multi-product technique can be devised.

Direct production costs for different rates of output can be included as well as the acceleration and inventory costs.The method stresses the totality of the production processes and the interrelation among its phases. The dynamic factors are apt to be nonlinear and because of this may be solvable only on digital computers.

A large automobile company reported that it is trying to "control production control." In this case there are a series of feeder lines, in different plants and firms, coming together in a vehicle assembly line. The scheduling is done on the rates of flow on these feeder lines. It is done on a cumulative basis. Backward time adjustments are made from end product requirements. Inputs are thus time compartmentalized into end product requirements, in transit requirements, and operational reserves.

Suppose that on X day they want a specific car to roll off the line. About 1000 parts and assemblies must be ordered. It takes about half a day for the assembling of that car to be completed. Suppose that the transmission takes 3½ days from ordering to arrive at the assembly plant. They must calculate time backwards to the assembly in the transmission plant, backward to gear and shaft plants, etc., in X-a, X-b, X-c, fashion for the respective assemblies, parts, stock, etc.

John F. Magee of Arthur D. Little, Inc., spearheaded the final session with a discussion of the reduction of inventory levels for a multi-plant firm, partially integrated, ad with serious seasonal problems. The solution, through linear programming, was discussed at length.

M. A. Kercher, General Commercial Engineer of the Bell Telephone Company of Pennsylvania spoke on the application of statistics to estimates of future demand for telephone service and the resulting requirements for new capital facilities. The problem is unique in that the exact geographic location of this demand must be found. This is difficult with population shifts and housing developments springing up over the state. In addition, the forecast must be for a long period since the construction of central office equipment requires, in itself, long term planning.

The session was concluded by a brief talk by each of the participants on the specific applications of statistics to their everyday production problems.

Report on Financial Planning and Control Section

by RUFUS WIXON
Moderator

The three sessions of the Financial Planning and Control Section of the Conference on Business Statistics were devoted to discussions of the following topics:

(1) Cash Forecasts and Budgets
(2) Capital Forecasts and Budgets
(3) Cost Control Techniques

Discission of the first topic was opened by representatives from the Board of Governors of the Federal Reserve System who presented data on the compilation of composite national figures of sources and uses of funds. Problems associated with the competence of the statistical data employed and projections of such data were mentioned. It was concluded that an aggregate statement of the sources and uses of funds is useful in the formulation of monetary policy in that it serves as a guide to prospective conditions in the capital market.

From the general approach, discussion moved to procedures and policies involved in determining cash

requirements of individual corporations. It was determined from the open discussion by the participants in describing practices within their companies that progressive budgeting of cash requirements is widely employed. Divergencies were indicated with respect to borrowing policy but considerable uniformity existed with respect to the handling of idle cash.

The session devoted to the second topic followed the pattern of the first session. Aggregative data was provided through a discussion of the McGraw-Hill survey of capital investment intentions. This was followed again by open discussion by the participants of the methods employed and problems encountered by their respective companies in formulating capital budgets. The use of long-range budgeting techniques and continuous review of long-term budgets was a point of agreement. In most instances justification for major capital expenditure projects was measured by expected rate of return on investment. The serious implications of such projects emphasized the need for careful collection and use of statistical data.

The final session employed a direct company approach to the problems of developing budgetary cost control standards, analysis of variances and results, and the problems associated with the presentation of cost statistics to management. In this session more attention was directed to the use of such specific statistical tools as sampling. The economies and accuracies obtained from the use of the sampling technique were clearly described by several participants. In addition, the graphic presentation of operating results came in for considerable discussion. It was agreed that budgeting of any kind requires cooperation and coordination of the individuals and departments involved.

Throughout the three sessions the concept of business statistics employed was a broad one. In other words, attention was not directed primarily at specific statistical techniques but rather toward the collection and use of both internal and external data necessary for financial planning and control. The enthusiastic exchange of methods and observations by the participants was the main contribution to whatever success the panel enjoyed.

Report on Distribution Panel

by REAVIS COX
Moderator

The distribution panel of the conference considered three areas of marketing in which many efforts are being made to apply statistical methods of analysis. These are the forecasting of sales, pricing, and the measurement of sales performance. Chairmen who led the discussions were Charles W. Moore, Wroe Alderson, and William E. Harrison. Approximately 50 people attended one or another of the sessions, most of them being present at all three.

If these discussions are a good indicator, the statistical technology used in distrubution is, in general, rather elementary. The more advanced techniques are little used. It seems likely, however, that the use of more sophisticated methods will spread quite rapidly.

There are some important problems to be solved before this result can be achieved. A very important one is the uneven quality of the data with which marketing men work. There is some inconsistency in trying to apply highly refined analysis to data that are at best rough approximations and estimates. Furthermore, short statistical runs often make it questionable whether the assumptions that underlie the advanced statistical methods really apply to the universes within which marketing men must live and make their choices. Another difficulty is that of selling statistics to the decision makers, who, in marketing at least, are not automatically grateful for refined and elegant formulas. There is also a great need to restate managerial problems in terms susceptible to statistical treatment.

Forecasting of sales probably is more advanced than either of the other two areas covered. The term covers different activities. Thus it may mean estimating what is going to happen in the economy to which a given company may adjust its plans. Again, it may mean planning what the company is going to try to make happen, so that it includes the setting of quotas and potentials with an element of incentive. Yet again, it may be the company's best guess as to what it really is going to achieve. The methods followed in setting up these various forecasts vary widely from company to company. They range from surveys intended to determine a sort of "sense of the meeting" or consensus of a company's operating staff to intricate devices of curve fitting and correlation. The variables forecast and the periods covered also vary widely.

In the management of pricing, the use of statistical

techniques is considerably less advanced. Only one-third of those in the distribution panel reported that their companies make use of statistical techniques in this activity. Such statistical methods as are used are very rudimentary in most cases. A number of those present said that their organizations try to set up supply and demand curves for their products in one way or another but their descriptions of the methods used were quite vague. Perhaps one fair conclusion was that voiced by Mr. Alderson that the kind of indoctrination received in economic theory as to how business men analyze their price problems bears little relation to what business men really do. If this is true, the problem of applying statistical techniques to pricing cannot be solved by working out more refined devices for use with traditional concepts.

In the evaluation of sales performance, statistical methods are used most generally to estimate market potentials for individual firms in their entire market or in particular territories. The potentials serve as standards or goals against which actual performance may be measured. There is also some use of statistics to evaluate the performance of individual salesmen. Some beginnings are found of the use of statistical controls in the development and application of sales strategy. In all these activities, the application of statistical techniques is still in its infancy, and the methods used are quite rudimentary.

Taken as a group, the three sessions were very helpful to those present. Although there were some holdouts, including representatives of two or three large companies, barriers of secrecy were greatly reduced as the discussion went on. By the close of the conference, the participants had become much more willing than at the outset to lay their cards on the table. A much freer discussion could be expected at future meetings, and it is likely that this would lead to more penetrating inquiries into problems of statistical technology than was possible this first time.

Discussion CONTINUED FROM PAGE 11

variations of different products and different problems within products that confront the statistician.

In this category we find that the statistician is personally concerned with policy matters. If his contact is not direct, he generally acts as an adviser to the production manager, sales manager, advertising director or some other top management official. The statistician not only has to be a good technician, but an artist as well. He has to be able to see when statistical methods can be used to solve a problem and, what is more important, to recognize the existence of statistical problems.

I should like to discuss the type of training an employer expects when a young statistician applies for a position in this second category of statisticians. These expectations are based upon the pioneering experiences of the Alfred Politz Research organization.

For many years it was believed that because of the variety of duties required of the statistician, technical training in statistics and mathematics was not a necessary requirement. We do not subscribe to this belief. In our organization we look for the following requisites when hiring statisticians:

1. *A good technical training in statistical methodology,* such as the theory of estimation and the testing of hypotheses.
2. *A reasonable amount of mathematics.* We look for candidates who have had mathematics through at least differential equations. With this characteristic and the one described above, we feel that the statistician is equipped with necessary tools to perform his function.
3. *We attempt to find someone with imagination.* An employee with creative imagination is one of the most important assets in our operation. In hiring a statistician, this is the most difficult trait to assess, since we know that "imagination" cannot be learned. However, we look for candidates that have been exposed, at least, to the problems of experimental design; and we tend to select persons who have taken and survived college courses in the natural sciences, such as physics, chemistry and biology. Students trained in these disciplines are at least familiar with the logic of setting up hypotheses and testing them. They know the importance of basic definitions and premises. They have been exposed to the differences between correlation and causation and, in many cases, can distinguish between cause and effect. Finally, many students with general scientific backgrounds are familiar with and have seen how models are set up.
4. *We also look for candidates who are able to think, express their thoughts and write clearly.* Since the statistician acts as an adviser to a policy maker, he must be able to explain, either verbally or in writing, the logic of his recommendations. He is often required to describe in layman's language the techniques he has used in arriving at his conclusions. Training in English composition is therefore important.

Report on the Activities of the National Bureau of Economic Research

Eleven volumes, containing staff research reports and the proceedings of Conferences held under the auspices of the National Bureau, were published during 1951. These included:

The Transportation Industries, 1889-1946: A Study of Output, Employment, and Productivity, by Harold Barger. Latest in a series of related studies of employment, production, and productivity in various industries of the American economy since the beginning of the twentieth century. New indexes of output, employment, and output per worker for all the transportation industries are presented, and trends in these measures in the past half-century are examined.

Deterioration in the Quality of Foreign Bonds Issued in the United States, 1920-1930, by Ilse Mintz. The results of an empirical investigation of the fluctuations in the quality of foreign bonds floated in the United States, 1920-30. It shows the relation between conditions at the time of issue of the loans and their quality as revealed by their subsequent experience.

What Happens during Business Cycles: A Progress Report, by Wesley C. Mitchell. This report explains the National Bureau's objective in undertaking its comprehensive investigation of business cycles; sets forth its basic concepts and methods of measurement; describes the great variety of cyclical fluctuations characteristic of economic activities; and closes with a composite picture of business cycles drawn on the basis of empirical observations that cover every branch of economic life.

The Nature and Tax Treatment of Capital Gains and Losses, by Lawrence H. Seltzer. Third volume in a series of fiscal studies. It deals with the important questions of the economic and legal nature of capital gains and losses and how they are treated in taxation. Among the questions studied are: What are capital gains? How do they differ from ordinary income in a legal sense and in an economic sense? Would higher tax rates on capital gains be desirable or should capital gains be exempted from income tax altogether, as they are in Great Britain?

Urban Real Estate Markets: Characteristics and Financing, by Ernest M. Fisher. Third in a series of urban real estate financing studies. It defines the economic characteristics of private property in urban land and improvements; describes the instruments of real estate finance; discusses the market in which homes are bought, sold or exchanged; and examines the means of financing home ownership.

Corporate Income Retention, 1915-43, by S. P. Dobrovolsky. This study carries forward into new ground the studies in business finance. It deals with questions such as the following: Were corporations saving more out of the net income in recent years than formerly? How do these income retention policies vary at different levels of corporate growth and profitability? How have changes in policies of income retention affected the dependence of industrial concerns on external money markets for funds to finance asset expansion? Wherever possible the questions with which the study is concerned are examined separately for large corporations and for those of small and medium size.

Factors Affecting the Demand for Consumer Instalment Sales Credit (Technical Paper 7), by Avram Kisselgoff. Results of an investigation of the factors influencing the demand for installment sales credit. This paper extends the earlier studies of consumer financing undertaken by the National Bureau.

History and Policies of the Home Owners' Loan Corporation, by C. Lowell Harriss. Fourth in the urban real estate financing series. It is an account of the origin, development, and liquidation of the Home Owners' Loan Corporation. The Corporation's lending activities, appraisal policies, and operating practices are described and its lending experiences are summarized.

Studies in Income and Wealth, Volume Thirteen. Ten papers dealing with the distribution of income by size. They analyze the characteristics of the data available for constructing distributions by size, describe the statistical techniques that may be used, and present some new estimates for recent years.

Conference on Business Cycles. Eleven papers presented at the Universities-National Bureau Conference on Business Cycles Research, November 25-27, 1949, together with comments on the papers by participants in the Conference. It is the first volume to be printed in a Special Conference Series resulting from the program of the Universities-National Bureau Committee for Economic Research.

Studies in Income and Wealth, Volume Fourteen. Seven papers with comments by discussants on national wealth.

A memorial volume of fourteen essays by different authors on the life and work of Wesley C. Mitchell was in press at the end of the year. The book, edited by Arthur F. Burns, will bear the distinctive and appropriate title *Wesley Clair Mitchell: Economic Scientist.* In addition to the essays it will contain a bibliography of Dr. Mitchell's writings.

Four other books and an Occasional Paper were also in press in December 1951:

Commercial Bank Activities in Urban Mortgage Financing, by Carl F. Behrens. Fifth in the urban real estate financing series. It describes the scope and legal framework of mortgage lending by commercial banks; analyzes the lending costs, operations, and experience of commercial banks with urban mortgage loans.

A Study of Moneyflows in the United States, by Morris A. Copeland. Results of a major inquiry into the flow of money payments. It develops basic measurements of moneyflows in the American economy and relates these flows to what we know about cash balances, government debt, consumer and farm credit, bank and insurance company portfolios, and the financial sources and uses of funds of industrial corporations.

Shares of Upper Income Groups in Income and Savings, by Simon Kuznets. Results of the study of

changes in the distribution of income by size, 1919-48, and their probable impact on the volume and source of savings. Some of the results in this study were summarized in Occasional Paper 35 issued in September 1950.

The Labor Force in War and Transition: Four Countries (Occasional Paper 36), by Clarence D. Long. This study traces the changes in size and composition of the labor force in the United States, Great Britain, Canada, and Germany during World War Two, the period of comparative peace that endured up to 1950, and, in this country, the first year of the Korean outbreak. It analyzes the factors responsible for the very different labor force behavior in the four countries, and indicates the possibilities for expansion in the event of all-out mobilization in the United States.

Conference on Research in Business Finance. Ten papers presented at the Universities-National Bureau Conference on Research in Business Finance, June 1950, together with comments on the papers by participants in the Conference. It is the second volume to be printed in a Special Conference Series resulting from the program of the Universities-National Bureau Committee for Economic Research.

Three research associates who have had training or teaching experience in universities in this country or Canada have been appointed to carry forward research at the National Bureau during the current academic year. These are:

Bert G. Hickman, Stanford University
Marshall A. Robinson, Tulane University
Gideon Rosenbluth, University of Toronto.

During 1951 the research program of the National Bureau was extended in several directions. Moses Abramovitz, on leave from Stanford University, is conducting initial explorations in an investigation of governmental economic activity. This will extend Solomon Fabricant's research on governmental employment in the United States. It will aim to develop similar data for the leading countries of Western Europe since 1900, to compare American and European experience, and to pave the way for further studies both of the expanding role of government in economic life and of comparative economic development.

A study of governmental lending has been started as a part of the Financial Research Program under the general direction of R. J. Saulnier. Studies of urban real estate finance and of agricultural finance emphasize the significance of governmental lending. The new study, made possible by a grant of funds from the Association of Reserve City Bankers, will attempt to cover all forms of governmental lending, loan guarantees, and loan insurance. It is designed to bring together the results of earlier research, to develop new factual data on the credit experience of governmental lending agencies, and to analyze the impact of their operations on the financial system.

Other new studies are concerned with governmental expenditures and resources. In connection with the capital requirements project Morris Copeland has begun an historical analysis of federal, state, and local capital formation and financing. This will complement the nearly completed work of Solomon Fabricant on the uses of resources by government and that of M. Slade Kendrick on trends in federal expenditures. A new investigation on the other side of the account is being carried out by John M. Firestone. This study deals with the cyclical behavior of federal revenues, based on monthly data compiled back to the 1880's. A study dealing with public debt management has been started by Marshall Robinson, a research associate.

Other new studies fall in the field of international economic relations. Solomon Fabricant is concentrating on changes in foreign investment in connection with the broad project on capital requirements. Penelope Hartland is working on this subject also, but centering attention on one country that has close ties with the United States, namely, Canada. Ilse Mintz is investigating the role of fluctuations in foreign trade in the business cycles of the United States and other countries.

To supplement the earlier work by Simon Kuznets in the distribution of income by size, Thomas R. Atkinson is exploring the size distribution of income by occupation.

An investigation dealing with industrial concentration and its determinants has been started by Gideon Rosenbluth. Bert Hickman, another research associate, is making a comparative study of business cycles in war and peace.

The activities of the Universities-National Bureau Committee for Economic Research have been extended. In accordance with the decision made in 1949 to enlarge the Committee, thirty universities offering graduate work in economics and emphasizing economic research were invited to participate. Twenty-eight accepted: Buffalo, California, Chicago, Columbia, Cornell, Duke, Harvard, Illinois, Iowa State College, Johns Hopkins, Massachusetts Institute of Technology, McGill, Michigan, Minnesota, New School for Social Research, New York, North Carolina, Northwestern, Pennsylvania, Princeton, Queen's, Stanford, Texas, Toronto, Vanderbilt, Virginia, Wisconsin, Yale.

The second Special Conference under the auspices of the Committee, held in June 1950, was devoted to Research in Business Finance. Papers presented at the Conference and the proceedings are in press and will be published in 1952.

The third Special Conference, on Regularization of Business Investment, was held in November 1951.

Plans for the fourth Special Conference are nearing completion. It will deal with Business Concentration and Price Policy and will be held in June 1952. Topics for two additional conferences, economic growth and location of industry, have been proposed, the conferences to be held in 1953 and 1954.

Frederick V. Waugh, of the Bureau of Agricultural Economics, has been appointed to the Board of Directors of the National Bureau, as representative of the American Farm Economic Association. Dr. Waugh was appointed to complete the unexpired term of Warren C. Waite, who died in November 1950.

Respectfully submitted,
FREDERICK C. MILLS

Montana State College,
Library,
Bozeman, Montana.
A/S
FWF

CHAPTER NOTES

ALBANY

The Albany Chapter opened its official 1952-53 season on Tuesday, October 7, at a panel meeting which was well attended by members and visitors. The subject, "Utilization of Statistics in Administrative Planning," was discussed from different points of view by K. F. Ficek, Chief of Planning, Division of Employment, New York State Department of Labor, E. T. Riker, Director of Planning, New York State Department of Taxation and Finance, and Irma Feldstein, Associate Examiner of Methods and Procedures, New York State Department of Health. Donald Axelrod, Principal Budget Examiner, State Division of the Budget, was moderator of the panel.

The Education Committee of the Chapter is sponsoring a course in advanced statistics, which is being offered in Albany by the Evening Division of Russell Sage College. Mr. Robert E. Patton, senior statistician in the New York State Department of Health, is teaching this course, which deals with the application of sampling techniques to area sampling surveys. Another course sponsored by the Chapter this year covers statistics below the college level and is being given in cooperation with the Training Division of the New York State Department of Civil Service.

Chapter members and their families gathered informally on September 13 for a picnic at the home of Dr. and Mrs. Joseph V. DePorte near Albany.

CENTRAL NEW JERSEY

The November 3 meeting was a roundtable discussion concerning "An Evaluation of Public Opinion Polling Results." The speakers were the following group of Princeton professors. Ansley Coale, Department Economics and Social Institutions; William Feller, Department Mathematics; F. F. Stephan, Department Economics and Social Institutions; S. S. Wilks, Department Mathematics.

The November 24 meeting heard Frederic Lord, Research Associate at the Educational Testing Service discuss "A Theory of Test Scores."

CHICAGO

The November meeting heard the following Panel discuss "How Useful Are Wage and Salary Surveys?"

The Panel:

Clyde E. Aultz, Director of Research and Statistics, National Metal Trades Association.

Roy Blothe, Research Analyst, Employers' Association of Chicago.

L. R. Chase, Customer and Office Service Manager, Johnson and Johnson, representing the Office Managers' Association of Chicago of which he is Second Vice-President.

Stanley P. Farwell, President, Business Research Corporation.

George Votava, Regional Wage Analyst, U. S. Bureau of Labor Statistics.

Moderator: Hal Steele, Chief Industrial Engineer, Belden Manufacturing Company.

The November luncheon meeting, (joint with American Marketing Association), heard Warren Cordell discuss, "Survey Quality Through Control of Response Errors."

DAYTON, OHIO

Officers elected to serve the Dayton chapter for the year 1952-53 were as follows: Edmund Churchill, President; Cyril G. Peckham, Vice-President; R. Ney Lizardi, Secretary-Treasurer.

The October meeting was held at the local IBM auditorium. J. Johnson, E. A. Amundson, and J. J. Lanigan spoke on "Uses of Punch Card Machine in Handling Statistical Problems."

DENVER

The October meeting of the Denver Chapter was held at Colorado A. & M. College in Fort Collins, Colorado. It was the first such "migration day" meeting for the Chapter.

Andrew G. Clark, Dean of the College and Professor of Mathematics at Colorado A. & M. College lead the discussions. Warren H. Leonard, Head of the Agronomy Section, discussed "General Survey of Experimental Designs" with the particular emphasis on the problems faced in the Agronomy field. Harris Guard, Head of the Mathematics Department talked on the "Teaching of Statistics at Colorado A. & M. Mrs. A. E. Landblom, Research Statictician, Colorado A. & M., was responsible for initiating and carrying through the many details of this very successful program.

HAWAII

The October issue of the Hawaii Chapter News Letter carries an article by Richard S. Takasaki on Statistics and the Science of Administration. The October Chapter meeting heard Albert Tester, professor of zoology at the University of Hawaii, speak on "Application of Statistics to Fisheries Research."

LOS ANGELES

1952-53 Officers are: President, John C. McKee, Douglas Aircraft Company; Vice President, William A. Craig, Slick Airways Incorporated; Secretary, Donald A. Smith, Los Angeles County Department of Parks and Recreation; Treasurer, Hugh Brown, California Taxpayers Association.

The Los Angeles Chapter now has a News Bulletin for distribution to its membership. The Bulletin lists local meetings, job openings, etcetera.

NEW YORK

Officers for the 1952-53 season are the following: President, Mortimer Spiegelman; Vice-President, Robert R. Behlow; Secretary, William Salkind; Treasurer, Virginia Holran.

The Executive Council is made up of Waite Brush, Nathan Cherniack and Lazare Teper.

So far this season five meetings have been held. They covered a variety of subjects: bio-statistics, business economics, social statistics, and statistical techniques. The highlight of November was the meeting on the business outlook for 1953.

PHILADELPHIA

The November meeting heard Arnold C. Harberger, Assistant Professor in the Department of Political Economy at Johns Hopkins University speak on "Resources for Freedom." His speech dealt with the broad and long range aspects of the nation's materials problem in relation to the need of the free and friendly nations of the rest of the world.

SACRAMENTO

The officers of the Sacramento Chapter for the forthcoming year are: President, Sam Osofsky,, State Division of Highways; Vice President, John B. Marshall, State Board of Equalization; Secretary-Treasurer, Norman Rudy, Sacramento State College.

At the October meeting, Nedra Belloc of the State Department of Public Health discussed the study of morbidity measurement being carried out in San Jose.

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